

The Synergy of Air and Space

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UNTIL THE GULF WAR of 1991, Air Force aviators and space professionals lived and worked in almost separate worlds. For their part, rated airmen were quintessential "operators" with an ingrained fingertip feel for the practical uses of airpower, given their responsibility for fulfilling mission profiles, which—unlike those in the nuclear arena—had an all-too-deadly air of plausibility about them. In contrast, USAF space professionals evolved not out of the rated flying community but from the secret world of space and missile research and development (R&D). For the first 10 to 15 years of the space program, those who created military space systems were devoted almost exclusively to ensuring nuclear deterrence and otherwise supporting the nation's strategic-level leadership. Naturally, their career development steeped them not in the warrior arts but in applied science, engineering, and systems management. That made for an almost preordained divide between the air and space components of the Air Force—a divide that became ever more apparent as military space systems increasingly emerged from the compartmented world into the light of day.

There even arose a mutual disdain between the two communities as rated versus nonrated distinctions began to form between the "real men" who wore wings and flew jets and those in the emerging missile and space

world who all too often were shrugged off by their aviator brethren as "techies," "pocket rockets" (a pejorative reference to the missileer's badge), and "space cadets"—or, worse yet, "space geeks." For their part, those beset upon professionals in the fledgling space community took note of their rejection by the operators and, in natural fashion, forged a self-protective sense of separate identity. That, in turn, led to a pressing by many in the space community for apartness rather than closer integration with the flying Air Force—and, indeed, for the development of a separate organizational base and doctrine. The more assertive among them went so far as to fashion themselves as the new Billy Mitchells of the dawning space age, looking to the day when they might become the vanguard of an independent space force.

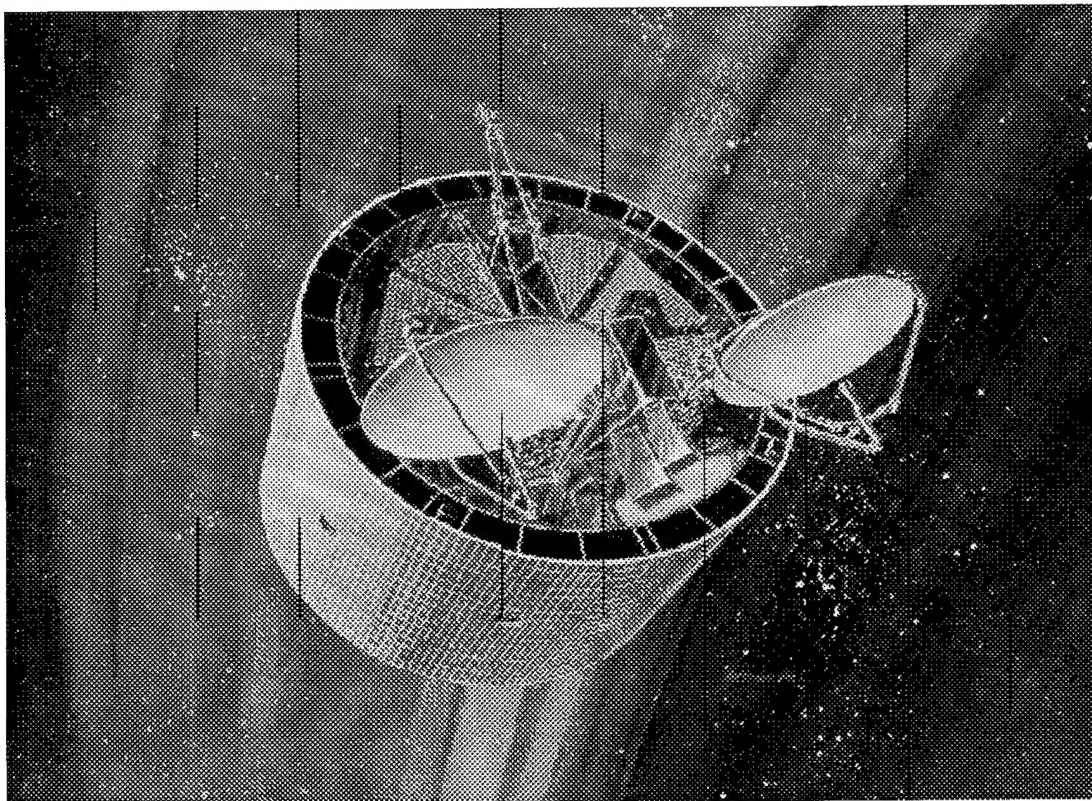
Only in the crucible of the Gulf War did the synergistic potential of air and space first begin to be fully recognized by rated airmen and space professionals alike. In manifold unexpected ways, space demonstrated what it could bring to the new face of air warfare as first displayed in Operation Desert Storm. In the end, the effective exploitation of space by US Central Command (CENTCOM) occasioned a post-Gulf War blossoming of space awareness at all levels offering unprecedented promise, albeit in a way and along a route perhaps least expected by either space professionals or rated operators.

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DSCS II Satellite. Three satellites of the Defense Satellite Communication System constellation on high orbit enabled continuous high-capacity, high-data-rate, worldwide secure voice communications for the allies during Desert Shield/Storm.

Space Support to Desert Storm

When Iraq invaded Kuwait on 2 August 1990, the first coalition assets to make their presence felt on scene were not air, naval, or land forces but space systems already on orbit high above the gathering storm. Although these assets played only a supporting role in the allied buildup and combat operations that followed, they were indispensable in determining the course and outcome of the war.

On the first count, the Navstar Global Positioning System (GPS) came of age by providing real-time navigation and targeting updates to numerous weapons types employed by coalition forces. It proved particularly useful because of the undifferentiated terrain of

the Iraqi desert, which presented unusually severe challenges to navigation. Aircrews in combat aircraft equipped only with inertial navigation systems used handheld GPS terminals to augment their less accurate analog navigational aids. Such GPS cues were also used by special operations forces for aircraft positioning, with Pave Low helicopters relying on them entirely for both day and night nap-of-the-earth penetrations into Iraq and Kuwait.

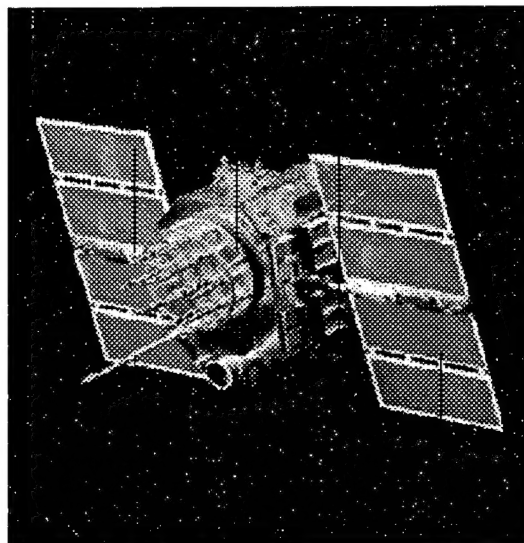
A limited number of handheld GPS receivers were available for use by allied ground personnel as well. At first, only a few hundred of these, popularly known as "pluggers" (for PLGR, an acronym for portable lightweight GPS receiver), were on hand for coalition forces. By the war's end, in what Gen Thomas Moorman Jr. called "the ultimate in opera-

tional pull," there were thousands.¹ As the value of these devices became clear and the demand for them peaked, the GPS Program Office made an emergency buy of 13,000 PLGRs for use on military vehicles, of which some forty-five hundred ultimately made their way to the theater.

As for allied communications, three satellites of the Defense Satellite Communication System (DSCS) constellation on high orbit enabled continuous high-capacity, high-data-rate, worldwide secure voice communications. These DSCS satellites supported 128 tactical terminals throughout the war. One of these was moved from the Pacific Ocean to the Indian Ocean to augment coalition communications—the first repositioning of a Defense Department satellite to support combat operations.

With respect to overhead surveillance and monitoring, satellites of the Defense Meteorological Satellite Program (DMSP) provided commanders and planners with near-real-time weather information. Among other things, they enabled remote analysis of the desert soil's moisture content to help determine the best routes for CENTCOM's "left hook" into Iraq and the Kuwaiti theater of operations. As for combat intelligence and battle damage assessment, classified national space-reconnaissance platforms—along with other allied capabilities—were key contributors toward obtaining electronic intelligence and multispectral images of the theater.

A space surveillance system that proved crucial in providing real-time warning of enemy Scud attacks was the Defense Support Program (DSP) constellation of infrared-sensing satellites, which were able to detect the heat of the Scud's exhaust plume within 30 seconds of launch. Although not originally designed to detect the launch of short-range ballistic missiles, DSP nonetheless helped greatly in alerting Patriot missile defense crews to an incoming attack. Thanks to three practice Scud launches by the Iraqis during the Desert Shield buildup, DSP operators were able to tweak the system for better operations in a quick-response mode. As a result, Air Force Space Command (AFSPC) was



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ready when the first Iraqi combat use of Scuds occurred on the second night of Desert Storm.

After the dust settled, Gen Merrill McPeak, the Air Force chief of staff, described Desert Storm as "the first space war," a characterization warmly embraced by many people in the space community.² Purists might demur on whether the strictly support functions performed by American space assets in that war were enough to justify such a categorical description. There is no denying, however, that the Gulf War represented the first instance in which the entire panoply of US space assets was employed in direct, if less than fully integrated, support of combat operations at all levels. That fact amply bore out the more telling point by a British defense leader that Desert Storm "taught us that space has changed the whole nature of warfare."³

Creation of an Operational Space Culture

At the outset of Desert Storm, commanders and planners had only limited insights into what space could do for them. For their part,

space professionals had little insight into the kinds of support that air, naval, and land war fighters needed. That mutual disconnect sug-

The appointment of Gen Charles Horner after Desert Storm as commander in chief of US Space Command (CINCSpace) proved particularly seminal with respect to bringing the space and flying communities closer together.

gested a core problem with relationships and understanding between the two communities that sorely needed fixing. At bottom, the problem entailed harnessing America's space assets more closely in support of the needs of the war fighter—a challenge that had never been systematically embraced by either side.

The appointment of Gen Charles Horner after Desert Storm as commander in chief of US Space Command (CINCSpace) proved particularly seminal with respect to bringing the space and flying communities closer together. This was not the first time that a fighter pilot had served as CINCSpace. However, Horner's recent experience in the Gulf made for a unique difference. As the joint force air component commander (JFACC) in Desert Storm, he had presided over airpower's greatest accomplishment since World War II, made possible by the indispensable contributions of America's space assets. As a grateful beneficiary of those contributions, he well knew what potential he was inheriting in his new assignment and moved with dispatch to get the space community pointed in the right direction.

One of the first milestones in the move to merge space with the war-fighting community was a windfall inheritance by AFSPC of the Air Force's intercontinental ballistic missiles (ICBM) as a by-product of the dissolution of Tactical Air Command (TAC) and Strategic Air Command (SAC). At the outset, Air Combat Command (ACC) found itself the new repository of the ICBM inventory. With

the missiles making, at best, for an uncomfortable fit with ACC's primary air-employment focus, however, they were soon transferred to AFSPC.

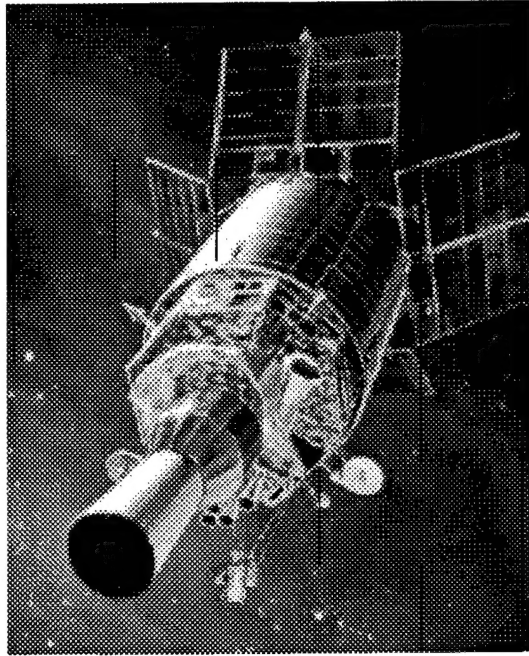
That move proved in hindsight to have been inspired from the perspective of both communities. Shifting the ICBMs from ACC to AFSPC gave the missileers a sense of identity with the space mission and the space technicians a credible claim to war-fighter credentials. The missileers found themselves, at long last, out from under the thumb of "airplane people" and embraced by a more sheltering community of like-minded professionals who spoke the language of space systems fluently. They brought to AFSPC not only a war-fighting function but also the operational mind-set that went with it. This included combatant-oriented habits ingrained by the observance of such rituals as being part of a concrete war plan, following normal and emergency procedures, meeting standardization evaluation criteria, and generally thinking like professionals with a "shooter" role and not just a spectrum of support missions to carry out. During roughly the same time, AFSPC was formally recognized by Title 10 of the National Defense Authorization Act as a "combat air force" (CAF).

Establishment of the USAF Space Warfare Center (SWC) at Falcon AFB, Colorado, on 1 November 1993 provided further evidence of operators imparting a new vector to military space development. Modeled on the USAF Weapons Center at Nellis AFB, Nevada, and the Air Warfare Center at Eglin AFB, Florida, SWC promptly became the cutting edge of a determined effort to integrate space more fully into the daily operating routines of the Air Force. Its avowed goal was not only to make space more relevant to the war fighter but also to breed war fighters out of space professionals along the way.

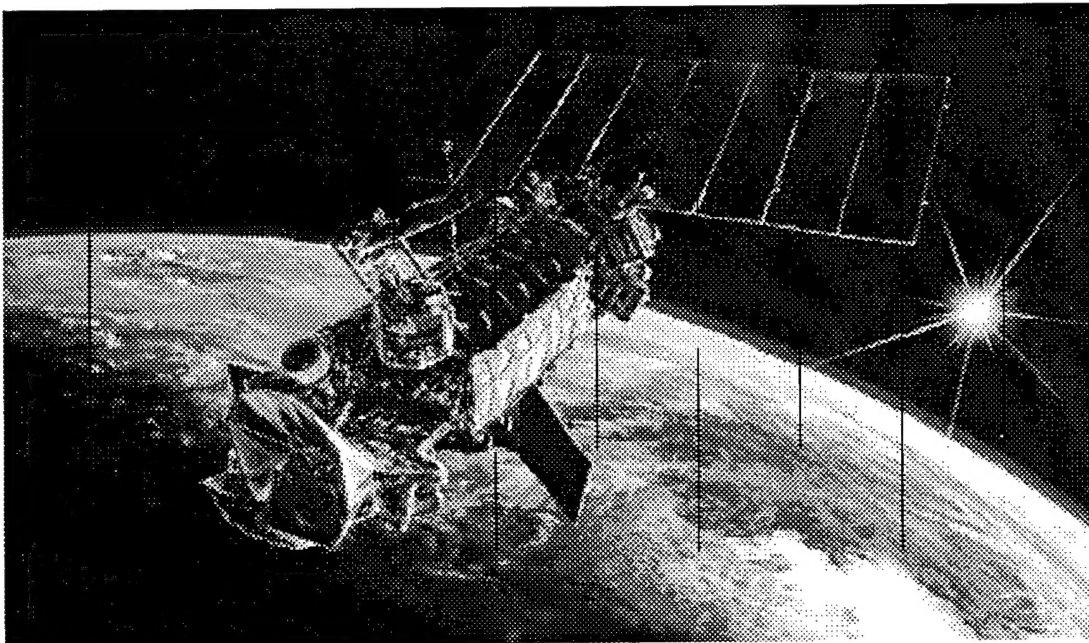
Activities of SWC to date have included the development of tools to exploit the accuracy of GPS information for target location and delivery of precision weapons; the prompt transmittal of space-derived intelligence and weather products to operators; and the use of existing communications systems to deliver

imagery, manifests, mission taskings, and even E-mail directly into the cockpits of airborne aircraft on combat missions. Strike II, a test out of Nellis AFB, provided an impressive demonstration of the potential offered by GPS for real-time mission targeting. In that test, satellite-derived target-location coordinates were used to successfully vector an airborne F-15E to attack a simulated mobile Scud launcher at night.

A related SWC activity involves cultivating a broadened base of expertise to support more fully integrated mission planning and execution for air and space. Innovations have included bringing space to Blue Flag campaign-planning exercises at Eglin AFB, the establishment of a space-training facility at Red Flag, and the addition of a Space Division (an evolution of the former USAF Space Tactics School) at the USAF Weapons School at Nellis AFB. The Weapons School now offers a Space Weapons Instructor Course, as well as hands-on training for aircrews in what space can provide at the sharp end of the lance. In particular, it shows how aircrews can exploit bit streams from the wide variety of military and commercial space systems to improve air-combat operations. The intent of these ef-



Above: DSP satellites provided real-time Scud-attack warnings. Below: DMSP satellites provided near-real-time weather information.



forts is to build a cadre of "space-smart" operators, both rated and nonrated, and to seed them throughout the CAF at all levels, with the ultimate goal of generating an expanded base of space literacy among those with their fingers on the trigger.

One can chalk up much of the ongoing integration of space with the operational community to the fact that AFSPC and the unified US Space Command have now had three CINCs in a row whose career maturation occurred primarily in the world of combat flying.

Now the "Nellis of space"—as its commander, Brig Gen Glen Moorhead, has called it—SWC has evolved since 1993 from supporting solely combat operations to supporting military operations of all kinds. General Moorhead, yet another career fighter pilot in the new world of space, has brought a warrior attitude to the heart of SWC and has infused it into SWC's day-to-day operating rhythm. Efforts to nurture such an attitude throughout SWC have included the establishment of a space-related Project Checkmate to provide operationally oriented threat assessment and the beginnings of a Multicommand Manual 3-1 publication for military space applications. They have even included initiatives to foster the atmosphere of a flying organization through such small but important symbolic gestures as authorizing space operators on headquarters assignment to wear flight suits or space-crew coveralls and scarves on Fridays, as well as a review of procedures for a space "emergency of the day" at morning staff meetings.

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Gen Joseph Ashy, a fighter pilot with comparable background who previously commanded NATO air operations over Bosnia. Ashy, in turn, was replaced by the current CINCSpace, Gen Howell Estes III, who once served as commander of the USAF's F-117 wing and later became director of operations (J-3) on the Joint Staff.

One can imagine impassioned debate among airmen who have made the career transition to space over whether two or three more CINCs of similar background at Space Command may be necessary to provide enough generational shift to assure the continuing integration of space with joint-force operators. There is little question, however, that—owing to the cumulative influence of Generals Horner, Ashy, and Estes—a sea change has occurred in the orientation and outlook of the space community. For years, space people all but begged for attention and acceptance by the operational Air Force, and "space push"—often to little or no avail—was typically the rule. Since Desert Storm, this rule has changed unmistakably to "operator pull," with former fighter people in senior leadership positions setting both the tone and the example. No doubt, this has elicited a mixed and still-uncertain reaction from some of the more tenured individuals in the space career field, who may privately wonder whether the apparent seizure of military space by these interlopers wearing wings has been a welcome development.

Much road remains to be traveled before rated and nonrated officers thrust together in the space community will learn to speak a common language. The relationship between the two groups is still uneasy in many respects, as old habits and thought patterns on both sides remain slow to evolve and mutual suspicions linger. That said, the bringing of space to the service of the war fighter is no longer something to which the Air Force merely pays lip service.

Perhaps most important as a symbolic testament to this change, the Air Force's latest mission statement, *Global Engagement: A Vision for the 21st Century*, has flatly pronounced that the USAF is now transitioning

from an "air force" into an "air and space force on an evolutionary path to a space and air force."⁴ That pronouncement, according to General Moorman, was "incredibly significant" in that it reflected not just the thinking of "a subset of folks doing a focused study, but rather the consensus of the Air Force leadership."⁵ Many people in the space community, notably including those who wear wings, would go further and insist that the USAF has already become a full-fledged "air and space force." Whatever one might believe on that score, there is no denying that all of the services now depend on space support. Thus, General Moorhead was on target when he pointed out that "space is no longer something that sits in a jar on a shelf with instructions that read 'break glass only in the event of war.'"⁶

Integrating Air and Space

The unprecedented focus on bringing together US air and space capabilities since Desert Storm may have been the single most influential development in making American military power so preeminent in the world today. As General Moorman has summarized the trend line, "An integrated air and space program that combines total battlefield awareness and knowledge with rapid and dependable communications to get information to the decisionmaker or shooter, fully integrated with highly capable, survivable aircraft and a fleet of unmanned aerial vehicles, both with precision munitions, is the wave of the future."⁷ Thanks to this new focus, space has now been routinely integrated into joint training and exercise schedules, US Space Command maintains a presence in support of every combatant commander, and every JFACC around the world has a permanent space-support cell.

That said, much remains before the Air Force's transition to a true air and space force is fully consummated. For the near term, the most effective leveraging of space toward the further enhancement of the nation's air assets will come from seeking synergy through

closer integration of existing forces (e.g., real-time tying together of inputs from space systems and unmanned aerial vehicles [UAV] to cue an element or flight of B-2s armed with precision, through-the-weather conventional bombs). This is the sort of innovative tactical option that a dedicated Multicommand Manual 3-1 for air and space might usefully codify.

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Beyond that, developing a more common language among those communities and breaking down the institutional walls that still keep them apart will be crucial for ensuring the completion of such a transformation. This will necessarily involve a two-way street. The good news is that people in the rated world who still characterize their nonrated space brethren as "space geeks" are, more and more, now doing so in a tone of accepting comradeship rather than in their once-dismissive way. This is as it should be, for the latter will have to be treated as fully equal fellow combatants—just as weapons systems operators in the fighter world have gradually come to be over time—if full integration of air and space is to occur.

Toward that end, consciously directed cross-fertilization between the two communities should help greatly in building and further spreading space awareness throughout the armed forces. One such avenue might emerge from greater interaction between Fourteenth Air Force—the organization at Vandenberg AFB, California, tasked with providing space support to the war fighter—and the USAF's other numbered air forces. Another may involve putting greater numbers of fighter pilots in space billets, just as they are now assigned as air liaison officers with Army field units, and bringing space operators with

weapons schooling and SWC experience into mainstream planning and training assignments throughout the CAF.

Any idea of working toward a separate space force, at least today, would be not only premature but also more harmful than helpful.

In tomorrow's air and space community, aviators will increasingly find themselves sharing the spotlight with UAV pilots, space controllers, and information warriors, all of whom will be bona fide trigger pullers with a common operational-level responsibility and outlook. It may be some time before information warriors and space combatants will displace line pilots in the topmost positions of Air Force leadership. However, there is no question that rated operators will have to become more fluent in the instruments of space and information warfare if they are to become truly adept in their use. There is also no question that the term operator will have to be rethought from the ground up in light of the space and information revolutions.

All of this suggests that any idea of working toward a separate space force, at least today, would be not only premature but also more harmful than helpful, considering that the synergy offered by recent developments in space exploitation requires integration with airpower rather than detachment from it. Gen John Jumper struck the right tone in this respect when, as deputy chief of staff for air and space operations, he stressed that

we want to make sure that as we evolve into the next decade and the next century, we don't suffer the same problem that the air corps had as it articulated its differences with the Army back in the late 1940s, [which] led them to the conclusion that they could only be addressed by creating a separate air corps, and then eventually could only be addressed by creating a separate air force. Our theory here is that in the era of air and space, we're all airmen at heart. . . . We shouldn't be arguing about the line of demarcation up there where the last

molecule of air has departed and we enter the vacuum of space. We should be arguing about the effects.⁸

Worst of all would be the establishment of an independent space force for the wrong reason. There is an entirely plausible reason why such an option might seem superficially attractive to some people. As General Horner has rightly observed, "As long as each service is funded at an artificial rate almost equal to one-third of the defense budget, the Air Force will be hard-pressed to fill its core air responsibilities, while expanding its role in space. All of this means that our space force may indeed become a military entity in its own right." Horner was on target in cautioning that "at some point, the nation must ask itself whether our air and space capabilities should remain artificially limited with the present budgeting methodology, when both functions are becoming of greater importance to our defense strategy."⁹ That noted, however, it would be a perversion of common sense to address such a problem, in the end, by organizational sleight of hand rather than by rational choice with respect to the proper apportionment of R&D and procurement funds.

Ideally, the military development of space should end up evolving much as airpower did from its modest beginnings in World War I to its maturation in Desert Storm. Physical differences between space and the atmosphere, such as those that distinguish astrodynamics from aerodynamics, will affect the mode of space operations but not their purpose. A functional or operational, as opposed to a systems, approach to thinking about the application of space power will make the differences between orbital and atmospheric operations irrelevant. Much as a RAND colleague has said of the USAF's decision to forgo any immediate thought of setting up a separate command for information warfare, one might say as well for space that any such separate service "would retard rather than promote the necessary integration . . . into the whole spectrum of Air Force operations. Operations [rather than organizational interests] should 'drive the train.'"¹⁰

Toward Full Mastery of the Vertical Dimension

The combination of the nation's many space assets has become an enabler not just of airpower but of all military power. This, in turn, has paved the way for a potential quantum change in the outlines of the interservice debate over roles and missions. Until recently, airmen could fairly claim that only they enjoyed a complete and unrestricted view of the battle space because of their command of the vertical dimension. Now, however, with the growing accessibility of space-derived global information by all combatants, all players—surface no less than air and space—can claim to “see beyond the horizon” and will have every incentive to seek an expanded piece of the action as a result. In developing joint space doctrine, the nation's defense leaders must ensure that the new leverage afforded by space is not allowed to feed distracting bureaucratic trench warfare over budget shares among the services, when the desired goal is a rational allocation of resources toward greater force integration by all of them.

Today, the United States stands at a crossroads regarding the next step in leveraging its space opportunities to greatest effect. One pointed question raised by some senior space officials concerns whether the services should take the near-term gamble of minimizing, or even skipping altogether, sizable chunks of the next generation of platform procurement so as to free up the necessary resources for operationalizing the new high ground of space sooner rather than later. Of course, few among them would disagree that the nation must maintain adequate levels of capability in the more developed elements of airpower, such as combat aircraft, precision weapons, and data-fusion systems that will make the most of what they have to offer in the near term. Yet, with no peer competitor on the horizon for at least the next decade and perhaps longer, it has become eminently debatable what “adequate levels of capability” means in practice. A core choice among

the many options from which any resource-allocation trades with respect to space are likely to come may thus be between continuing as planned with next-generation platforms and proceeding more aggressively to jump-start the military-technological revolution.

Whatever the outcome, only in the context of a well-conceived and agreed-upon national strategy can such choices be made intelligently and responsibly. One fail-safe way of helping to ensure that the right choices get made will be to have a disciplined space road map that begins with clear concepts of operations and lets these drive requirements, rather than giving technology the lead. Here, America's past experience with airpower theory should be especially pertinent in counseling against repeating the mistake of the early airpower zealots by promising too much too soon.

In all, if one views space from an operational rather than an organizational or systems perspective, one will naturally be driven to see it as simply an extension of the vertical dimension. Airmen should strive to exploit space to the extent of their resources in pursuit of the abiding goals of airpower since the first days of military aviation. After all, just as airpower was the cradle of space exploration, so exploiting space as a part of the vertical dimension will be crucial to the full and final maturation of airpower. General Moorman seemed to have that in mind when he suggested in 1992 that “looking ahead a few years, one can speculate that advocates of both air power and space power will likely be talking about similar issues.”¹¹ As it turned out, he was right. There is great merit to the proposition that space is merely a place, not an independent military mission or function.

People at the leading edge of military space exploitation over the past two decades have, to date, been much like modern-day equivalents of the early pioneers of the US Army's Air Corps Tactical School during the 1920s and 1930s, who struggled hard to earn a place at the table for airpower in the development of national military strategy and capability. Among the many indicators of this fact, one

could include the emergence of "space" as a USAF career field, the issuance of special "space" uniform insignia, efforts to formulate a military "space" doctrine, calling Desert Storm the first "space war," and ultimately the standing up of AFSPC and US Space Command. These and similar occurrences have been inevitable, yet, in all likelihood, also transitional milestones in today's still-embryonic process of making the leap from airpower to air and space power. As such, they will probably become more and more vestigial over time as the seams between air and space ultimately dissolve.

Once that happens, airmen of the twenty-first century will be as comfortable with operations in and around space as they are today with the lower reaches of the vertical dimension. Such a future may also see a gradual dissolution of the current organizational lines

that separate space from the more familiar world of air-breathing aviation, much as TAC and SAC disappeared as separate entities with the dawning realization that distinctions between "strategic" and "tactical" had become artificial with the changed nature of air and space warfare. The strongest affirmation of the latter was the spectacle of nominally "tactical" F-117s performing supremely strategic operations during the opening moments of Desert Storm and B-52s providing fire support to friendly ground forces during the final days of the Gulf War. There is every reason to expect a similar withering away of today's conceptual and organizational demarcations between "air" and "space." This will occur as the application of airpower and space power toward terrestrial joint-force objectives becomes second nature to operators, whether or not they wear wings. □

Notes

1. Lt Gen Thomas S. Moorman Jr., "Space: A New Strategic Frontier," *Airpower Journal* 6, no. 1 (Spring 1992): 19.
2. Gen Merrill A. McPeak, briefing on Desert Shield and Desert Storm to the National War College, 6 March 1991.
3. Quoted in Sir Peter Anson and Group Capt Dennis Cummings, "The First Space War: The Contribution of Satellites to the Gulf War," *RUSI Journal*, Winter 1991, 53.
4. Quoted in Daniel Gouré and Christopher M. Szara, *Air and Space Power in the New Millennium* (Washington, D.C.: Center for Strategic and International Studies, 1997), 38.
5. Gen Thomas S. Moorman Jr., USAF, to the author, letter, subject: Earlier Draft of Author's APJ Article, 8 July 1997.
6. Brig Gen Glen W. Moorhead, USAF, "The Space Warfare Center," briefing to the author, Falcon AFB, Colo., 4 April 1997.

7. Gen Thomas S. Moorman Jr., "The Challenge of Space beyond 2000," in Alan Stephens, ed., *New Era Security: The RAAF in the Next Twenty-Five Years* (Fairbairn, Australia: RAAF Air Power Studies Centre, 1997), 173.

8. "Air Power Initiatives and Operations: Presentation for the European Air Attaché Conference," annotated briefing, n.d.

9. Gen Charles A. Horner, "Air Power: Growing beyond Desert Storm," *Aviation Week and Space Technology*, 16 April 1997, 73.

10. Glenn Buchan, *Information War and the Air Force: Wave of the Future? Current Fad? IP-149* (Santa Monica, Calif.: RAND, March 1996), 9-10.

11. Moorman, "Space: A New Strategic Frontier," 22.

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